

**MEMORANDUM on the movement for reckoning time on a scientific basis, by which the greatest possible degree of simplicity, accuracy, and uniformity will be obtainable in all countries throughout the world.**

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1. Notwithstanding the great advance which has been made during the present century, in all the Arts and Sciences and their application to the affairs of human life, the reckoning of time is still in a primitive condition in many countries and in an imperfect condition in every country. Difficulties have been developed since the introduction of rapid means of communication, through the twin agencies steam and electricity, which when examined prove that time is computed generally on principles which are untenable. The world's time-reckoning is in fact an exceedingly complicated combination; it is productive of confusion and the confusion is apt to be increased and intensified as population increases and lines of rapid communication are multiplied.

2. During the last ten years efforts have been made to overcome the evils referred to by establishing a remedial system on a sound scientific basis which would be acceptable to all nations and by which perfect accuracy, uniformity, and simplicity would everywhere be obtainable.

3. The subject has been carefully considered by many individuals and by Scientific Societies in Europe and America. It has been discussed at Geographical and Geodetic Congresses at Venice and Rome; and at Conventions of Scientists and practical business men in America. On all these occasions the solution of the problem has been promoted. As an outcome of these various meetings and efforts, the President of the United States, under the authority of an Act of Congress, invited the Governments of all civilized nations to appoint delegates to meet in conference at Washington to consider the whole question and take decisive action in respect thereto.

4. The Washington Conference embraced delegates from twenty-five nations, they had eight sessions, the first was held on 1st October 1884, the last on 1st November following. After patient deliberation and discussion the object of this International Conference was accomplished by the passage, with substantial unanimity, of a series of resolutions determining the principles upon which all the nations of the world may unite in the adoption of a universal system of reckoning time.

5. The important results of the Conference are the establishment of (1) a prime meridian for reckoning longitude, (2) a zero for time reckoning, and (3) a unit-measure of time to be common to the whole world.

6. The prime-meridian corresponds with the Greenwich meridian.

7. The zero of time may be defined as the moment of mean solar passage on the anti-prime meridian.

8. The unit-measure of time, designated the universal day, may be defined as the interval between two successive mean solar passages on the anti-prime meridian.

9. The Conference further determined that the hours of the Universal day shall be counted in a single series from zero to 24.

10. The Universal day as defined by the Washington Conference begins and ends at the same moment as the civil day at Greenwich, but it differs from the Greenwich civil day in respect to the numbering of the hours. While the Universal day has a single set of hours numbered from 0 to 24, the Greenwich civil day is divided at noon into halves, the half days before and after noon being sub-divided into separate sets of hours each numbered from 0 to 12 and distinguished as Ante-meridian and Post-meridian. Greenwich time is the local time so-called of the meridian of Greenwich. Universal time, on the other hand, is understood to be common to all localities and the Universal day is held to be the date of the world.

11. Considerable progress has been made in the adoption of the principles of universal time and the practical success which has attended the application of these principles goes to show that the unification of reckoning by the several civilized nations can best be effected step by step.

## RECKONING BY HOUR MERIDIANS.

12. The first important step is the adoption of the "Hour Zone System," commonly designated in America "Standard Time." It may be stated, that in the theory of Universal time the fundamental principle is unity, it is held that there is not more than one time in the whole Universe and that the idea of separate and distinct times in each separate locality is incorrect. While the essential principle of Universal time is indisputable it cannot be denied that a perfectly uniform notation of time throughout the entire globe comes into direct conflict with our preconceived notions and habits of thought. The Hour Zone system is introduced as an easy means of transition from old to new ideas and it is found that by adopting Hour Meridians as local standards for reckoning, grave difficulties are in a large measure overcome without any violent departure from our inherited usages and prevailing customs. The hour zone system also furnishes the means of applying the correct principles of Universal time in ordinary affairs.

13. In the Hour zone system the circumference of the Globe is divided into twenty-four sections or zones. The central line of each zone is an hour meridian, and the hour meridians are fifteen degrees of longitudes apart. The accompanying chart of the world on Mercator's projection shows the geographical position of the twenty-four hour meridians. They are numbered in consecutive order towards the west from zero, the ante-prime meridian.

14. The Hour zones theoretically extend seven and a half degrees of longitude on each side of the hour meridians, but in practice that is by no means an essential rule. The boundary line of contiguous zones may be governed by national, geographical, or commercial circumstances.

15. As the earth rotates on its axis in twenty-four hours an hour elapses between the solar passage on each successive hour meridian, it is obvious therefore that if the reckoning in each zone be governed by its respective meridian, the reckonings everywhere will be directly related. There will be differences but the differences will in every case be known and they will invariably be multiples of an hour. Throughout the Globe there will be complete identity in the minutes and seconds. For example when the reckoning in the tenth zone is six hours twenty-five minutes, in the eleventh zone it will be five hours twenty-five minutes, in the twelfth zone four hours twenty-five minutes, and so on, each successive zone differing by an exact hour. Thus the only departure from complete uniformity in reckoning around the Globe will be in the numbers of the hours, but the numbers of the hours being governed by the numbers of the hour meridians, the passage to Universal time is simple and direct.

16. As the reckoning in the zone of the twelfth hour meridian corresponds with Universal time the reckonings in all zones to the East of that meridian will be one or more full hours in advance of Universal time and in all zones to the West of the twelfth hour meridian the reckonings will be behind universal time. Universal time will be the mean of all possible reckonings under the hour zone system, and the Universal day the mean of all possible local days.

17. The hour zone system has been adopted for ordinary use in portions of the three Continents of Asia, Europe, and America. In 1887 an Imperial Ordinance was promulgated directing that on and after the first day of January in the year following, time throughout the Japanese Empire would be reckoned by the third hour meridian. The reckoning in England and Scotland is by the twelfth hour meridian, in Sweden the eleventh hour meridian is the standard and quite recently it has been resolved in Austria-Hungary to be governed by the same meridian. Efforts are now being made to follow the same course in Germany and in other European countries. In North America the hour zone system has been in general use for six years. The reckoning of time being governed as follows, namely:—

By the 16th Hour meridian in Nova Scotia and Prince Edward Island.

By the 17th hour meridian in New Brunswick, Quebec, Ontario, Maine, Vermont, Massachusetts, New Hampshire, Connecticut, New York, Pennsylvania, Rhode Island, New Jersey, Maryland, Virginia, North and South Carolina, Georgia, Florida.

By the 18th hour meridian in Manitoba, Kewatin, Minnesota, Wisconsin, Michigan, Iowa, Ohio, Illinois, Indiana, Kentucky, Missouri, Arkansas, Tennessee, Alabama, Mississippi, Louisiana.

By the 19th hour meridian in Assiniboia, Saskatchewan, Alberta, Athabasca, Montana, Dakota, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Texas, Utah, Arizona.

By the 20th hour meridian in British Columbia, Washington, Idaho, Oregon, Nevada, California.

18. The adoption of the hour zone system has been the means of removing the chaos of local times which in many quarters previously caused much friction. Wherever the reckoning is governed by the same standard meridian there is complete uniformity in every division of time. In Japan, Central Europe, Great Britain, United States, Canada, and Mexico, identity of reckoning prevails. In all these countries the hours are struck at the same moment, the only difference is in the numbers by which they are locally known; with that single exception every division of the day is simultaneous.

#### THE 24 HOUR NOTATION.

19. The second important step in regulating the reckoning of time throughout the world, is to abandon the division of the day into ante-meridian and post-meridian hours, separately numbered, and to substitute a single series of hours numbered from 0 to 24. This change was resolved upon by the Washington Conference with respect to the Universal day.

20. The old practice of dividing the day into separate sets of twelve hours, however it arose, has not only no advantage to recommend it, but the usage has been found to have positive disadvantages, which have been brought into prominence within the past generation. The division of the day into halves, doubles the chance of error and tends to confusion in connection with the running of railway trains. The mis-print or mistake of a single letter, A.M. for P.M. or *vice versa* will easily arise to cause inconvenience, loss of time, possibly loss of property, or loss of life.

21. The 24 hour notation, so called, removes all doubt and uncertainty and promotes safety. Where it has been adopted in Canada there is no ambiguity, moreover the change has been effected without difficulty and without danger. The hours having a lower number than twelve are known to belong absolutely to the first part of the day, and those having a higher number to the afternoon and evening.

22. The 24 hour notation is strongly recommended by prominent men in Russia, Germany, Italy, Austria, Belgium, France, Spain, Great Britain, indeed it may be said in every country in Europe. It is brought into daily use on the great lines of telegraph leading from England to Egypt, India, China, Australia, and South Africa. It is received with very great favour in America. It has been in use for nearly four years on 2354 miles of the Canadian Pacific Railway and for nearly three years on the Canadian Government Railway, the Inter-colonial, 986 miles in length. The Managers of these railways and all the employees speak of the 24 hour notation in the highest terms. It is the only system in use at this date, north of the 49th parallel and west of the 89th meridian. There is not a Province in Canada where it is not already in use. It has been adopted on the railways in Nova Scotia, New Brunswick, Prince Edward Island, Manitoba, Assiniboia, Alberta, British Columbia, and partly in Quebec and Ontario; so satisfactory are the results of the new notation that it has been determined to extend its application and it is expected that before long it will be in general use for railway purposes throughout the Dominion.

23. In the United States a strong expression of opinion in favour of the 24 hour notation has been obtained. The American Society of Civil Engineers, deeply concerned in the perfection of the railway system of the Republic, has since the year 1880 taken an active interest in time reform. This Society led the way in preparing the minds of men for the general acceptance of the Hour Zone system six years ago, and since then it has vigorously directed attention to the 24 hour notation. It has a special Committee whose duty under the authority of the Society is to correspond with Railway Managers on the subject, and in every proper way to promote the adoption of the new notation. The communications which have been sent out by the American Society of Civil Engineers to the leading railway men throughout the country have elicited a very large number of replies. They embrace the opinion of, it is believed, a considerable majority of the managers of all the Railway Companies in North America and of all who have been heard from about 97 per cent. are in favour of the adoption of the 24 hour notation in the railway service of the country at an early date. It is quite obvious that there is a wide spread feeling in favour of the change and it only remains for the General Time Convention, an organized body, representing all the railways in the United States, to take decisive action in the matter, so that the new notation may be brought into use simultaneously in every section of the country.

24. Canada in adopting the hour zone system and in introducing the 24 hour notation has undoubtedly taken the lead in carrying into effect, in the most practical manner possible, the essential principles of Universal time. The 24 hour notation has likewise been introduced in the Railway service of China, and it is not a little remarkable that one of the oldest Eastern civilizations conjointly with the youngest Western civilization should set an example in breaking through the trammels of custom to inaugurate a reform which every intelligent person believes to be desirable. Universal time will be substantially adopted in North America so soon as the 24 hour notation is brought into use throughout the United States.



There is but one step necessary to secure to Great Britain all the advantages of Universal time, that is the adoption of the 24 hour notation; this one reform concerns the railway system and railway travellers especially, and in a country where all travel more or less, I cannot but think that if English Railway Managers were informed as to the ease with which the change has been introduced in Canada and the satisfactory results which have followed, they would very speedily take means to obtain similar advantages. I am confirmed in this view by an examination of the letters which have been received by the Science and Art Department, South Kensington, copies of which I have been favoured with. These letters go to show that the resolutions of the Washington Conference on this subject are cordially favoured by the following important bodies and Departments, viz:—

1. Royal Astronomical Society.
2. The Royal Society.
3. The Board of Trade.
4. The General Post Office.
5. The Eastern Telegraph Company.
6. The Eastern Extension Telegraph Company.
7. The Eastern and South African Telegraph Company.
8. The Society of Telegraph Engineers.
9. The Trinity House.
10. The India Office.
11. The Colonial Office.
12. The Admiralty.

To these may be added the Committee of Council on Education, and the Board of Visitors of the Royal Observatory, Greenwich. Indeed, I cannot learn that a single objection has been received from any quarter.

25. As the fundamental objects of the Washington Conference were to remove all doubt and ambiguity in time-reckoning, to prevent discrepancies, to secure simplicity and introduce uniformity, it is manifestly important that the changes proposed, supported as they were at the Conference by the representatives of twenty-five nations, and subsequently looked upon in so many quarters as in themselves intrinsically desirable, should without unnecessary delay be accepted and as far as practicable put in force generally. The first important step is the selection of hour meridians and the adoption of the hour zone system. With these objects in view the accompanying map has been prepared, it shows the position of the twenty-four hour meridians and indicates in a general way the country or section of country to which any particular hour meridian has greatest proximity. It would greatly advance the unification of time throughout the world and greatly promote the common good of mankind if every nation with all convenient speed would take means to select the hour meridians on which its reckoning of time may be based. Appended hereto will be found a table indicating the hour meridians which in each case may be found eligible for selection, but in a matter of this kind each nation must judge for itself.

26. I have mentioned what has been done in America, more especially in Canada, in furtherance of this movement. If means be taken to extend the use of the hour zone system to all the British possessions around the Globe they will individually and collectively participate in the advantages of a common reckoning of time. I venture to submit, suggestively, the appended list of the principal British Colonies and Dependencies with the hour meridians which appear the most suitable for standards in each case.

SANDFORD FLEMING.

OTTAWA, 20th November, 1889.

## BRITISH POSSESSIONS.

Table indicating the Hour Meridians, numbered as on the accompanying Map, which may be selected as local Standards for reckoning time in each of the several British Possessions.

The last column gives the differences between local reckonings and the time of the world—Universal Time. The sign PLUS indicates that local reckonings are in advance of, and MINUS that they are behind, World Time in each case.

COUNTRIES.	Hour Meridians.		Hour Zone Reckonings faster or slower than World Time.
	East or West of Greenwich.	Numbered on Map.	
The British Islands (comprising)—			
England and Wales	0	12	0 Hours
Scotland	0	12	0 "
Ireland	0	12	0 "
Canada (comprising)—			
Nova Scotia	60 West	16	- 4 "
New Brunswick	75 West	17	- 5 "
Prince Edward Island	60 West	16	- 4 "
Quebec	75 West	17	- 5 "
Ontario	75 West	17	- 5 "
Manitoba	90 West	18	- 6 "
Assineboia	105 West	19	- 7 "
Saskatchewan	105 West	19	- 7 "
Alberta	120 West	20	- 8 "
Athabasca	120 West	20	- 8 "
British Columbia	120 West	20	- 8 "
Australasia (comprising)—			
New South Wales	150 East	2	+ 10 "
Victoria	150 East	2	+ 10 "
Queensland	150 East	2	+ 10 "
Tasmania	150 East	2	+ 10 "
South Australia	135 East	3	+ 9 "
Western Australia	120 East	4	+ 8 "
New Zealand	165 East	1	+ 11 "
Fiji	165 East	1	+ 11 "
New Guinea	150 East	2	+ 10 "
Possessions in Asia (comprising)—			
India	75 East	7	+ 5 "
Burma	90 East	6	+ 6 "
Ceylon	75 East	7	+ 5 "
Hong Kong	120 East	4	+ 8 "
Straits Settlements	105 East	5	+ 7 "
Labuan	120 East	4	+ 8 "
West India (comprising)—			
Jamaica	75 West	17	- 5 "
Turks Island	75 West	17	- 5 "
British Guiana	60 West	16	- 4 "
Bahamas	75 West	17	- 5 "
Trinidad	60 West	16	- 4 "
Barbadoes	60 West	16	- 4 "
Grenada	60 West	16	- 4 "
British Honduras	90 West	18	- 6 "
St. Vincent	60 West	16	- 4 "
St. Lucia	60 West	16	- 4 "
Tobago	60 West	16	- 4 "
Antigua	60 West	16	- 4 "
Montserrat	60 West	16	- 4 "
St. Christopher	60 West	16	- 4 "
Virgin Islands	60 West	16	- 4 "
Dominica	60 West	16	- 4 "
Possessions in Africa (comprising)—			
Cape of Good Hope	30 East	10	+ 2 "
Bechuanaland	30 East	10	+ 2 "
Basutoland	30 East	10	+ 2 "
Natal	30 East	10	+ 2 "
Sierra Leone	15 West	13	- 1 "
Gambia	15 West	13	- 1 "
Gold Coast	0	12	0 "
Lagos	0	12	0 "
Miscellaneous (comprising)—			
St. Helena	0	12	0 "
Gibraltar	0	12	0 "
Malta	15 East	11	+ 1 "
Cyprus	30 East	10	+ 2 "
Bermuda	60 West	16	- 4 "
Falkland Islands	60 West	16	- 4 "
Heligoland	15 East	11	+ 1 "
Aden	45 East	9	+ 3 "
Ascension	15 West	13	- 1 "
Fanning Island	150 West	22	- 10 "
Mauritius	60 East	8	+ 4 "
Newfoundland	60 West	16	- 4 "

## FOREIGN COUNTRIES.

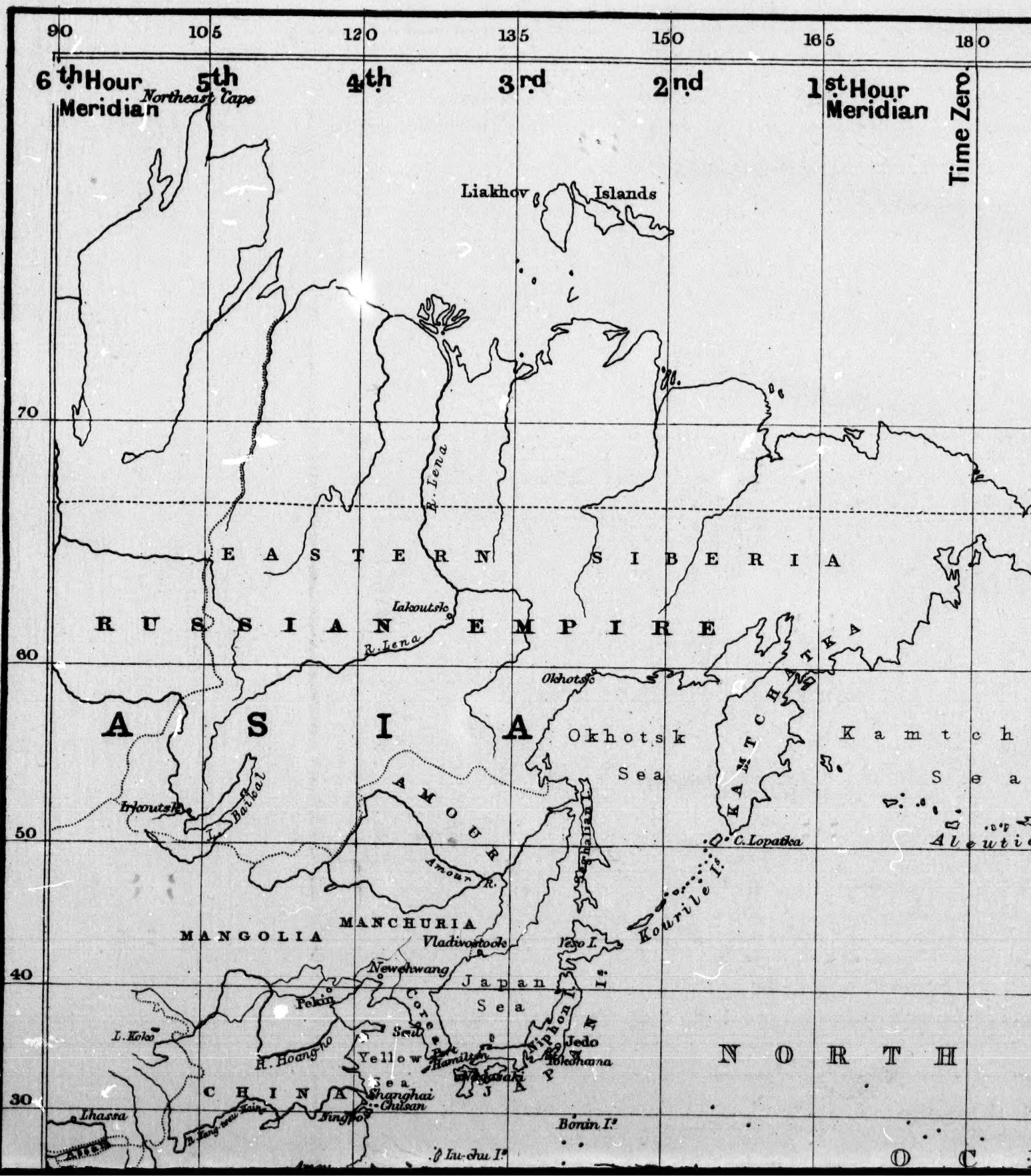
Table showing the Hour Meridians numbered as on the accompanying map and conveniently situated for reckoning time under the Hour Zone system.

The last column gives the differences between local reckonings and the Time of the World—Universal Time.

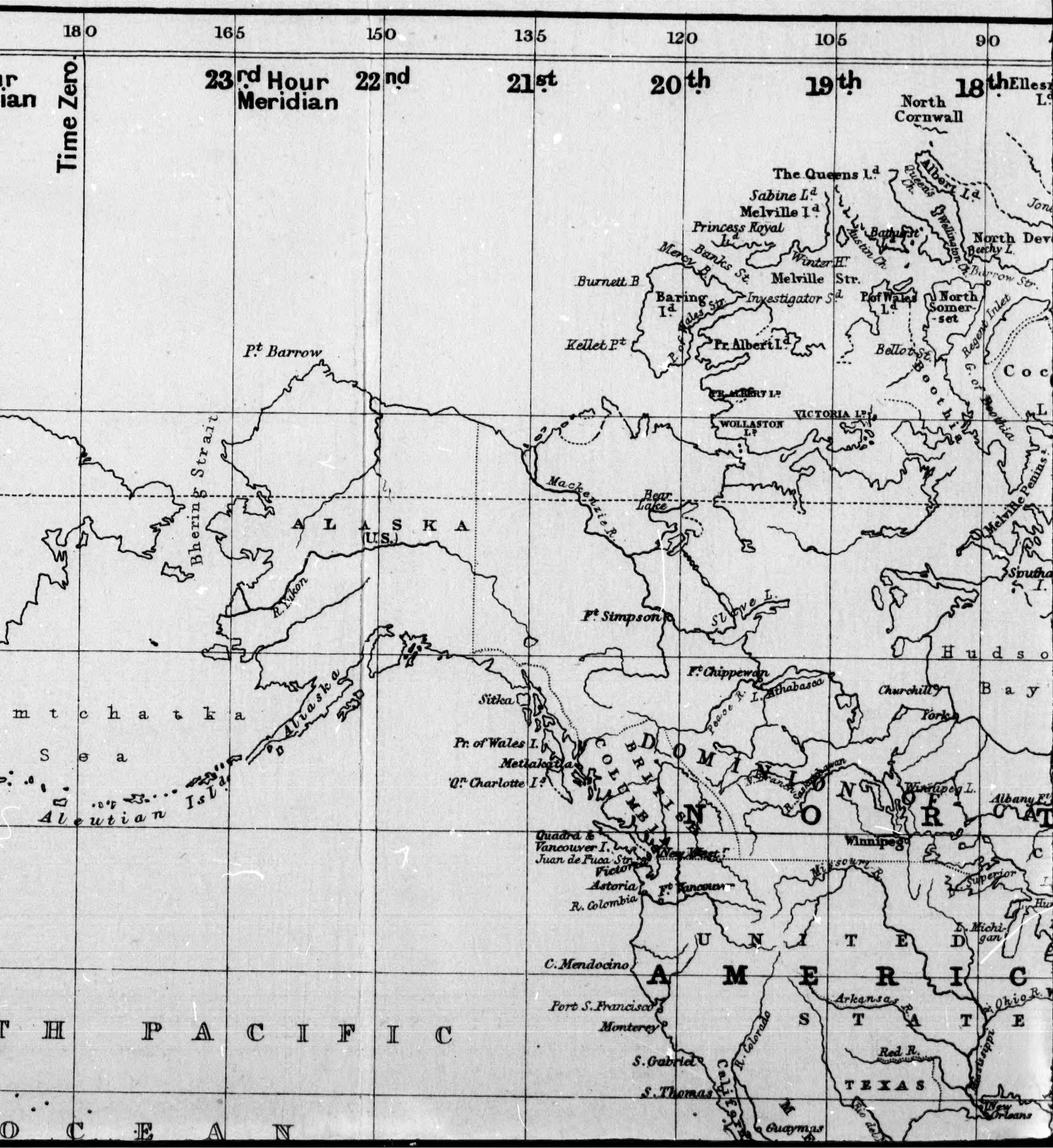
The sign PLUS indicates that local reckonings are in advance of, and MINUS that they are behind, World Time in each case.

COUNTRIES.	Hour Meridians.		Hour Zone Reckonings faster or slower than World Time.
	East or West of Greenwich.	Numbered on New Map.	
Argentine Republic	60 West	16	- 4 Hours
Austria Hungary	15 East	11	+ 1 "
Belgium	0 —	12	0 "
Bolivia	60 West	16	- 4 "
Brazil	45 West	15	- 3 "
"	60 West	16	- 4 "
Bulgaria	30 East	10	+ 2 "
Costa Rica	90 West	18	- 6 "
Chili	75 West	17	- 5 "
China	120 East	4	+ 8 "
"	105 East	5	+ 7 "
Columbia	75 West	17	- 5 "
Congo	15 East	11	+ 1 "
Denmark	15 East	11	+ 1 "
St. Domingo	75 West	17	- 5 "
Egypt	30 East	10	+ 2 "
France	0 —	12	0 "
Germany	15 East	11	+ 1 "
Greece	30 East	10	+ 2 "
Hawaii	150 West	22	- 10 "
Honduras	90 West	18	- 6 "
Hayti	75 West	17	- 5 "
Italy	15 East	11	+ 1 "
Japan	135 East	3	+ 9 "
Mexico	105 West	19	- 7 "
Netherlands	0 —	12	0 "
Nicaragua	90 West	18	- 6 "
Norway	15 East	11	+ 1 "
Paraguay	60 West	16	- 4 "
Persia	60 East	8	+ 4 "
Peru	75 West	17	- 5 "
Roumania	30 East	10	+ 2 "
Siam	105 East	5	+ 7 "
Servia	30 East	10	+ 2 "
Spain	0 —	12	0 "
Sweden	15 East	11	+ 1 "
Switzerland	15 East	11	+ 1 "
Turkey	30 East	10	+ 2 "
Russia in Europe	45 East	9	+ 3 "
"	30 East	10	+ 2 "
Russia in Asia	165 East	1	+ 11 "
"	150 East	2	+ 10 "
"	135 East	3	+ 9 "
"	120 East	4	+ 8 "
"	105 East	5	+ 7 "
"	90 East	6	+ 6 "
"	75 East	7	+ 5 "
"	60 East	8	+ 4 "
Uruguay	60 West	16	- 4 "
United States	75 West	17	- 5 "
"	90 West	18	- 6 "
"	105 West	19	- 7 "
"	120 West	20	- 8 "
Alaska	135 West	21	- 9 "
"	150 West	22	- 10 "
Venezuela	60 West	16	- 4 "





# THE WORLD ON MERCATOR'S PROJECTION







# ANS FOR REGULATING STANDARD TIME.



# TIME.

